CLAIMS

We claim:

1. A method of processing an image of a printed circuit board (PCB) to inspect a hole with a specified hole position on said PCB, where said specific hole position is over a conductive pad on the surface of said PCB defining a pad edge, comprising:

processing said image to determine the amount of said pad within a first region of said image;

comparing the amount of pad material within a first region with an error threshold; and

providing an indication of the acceptability of said hole from the results of said comparing.

2. The method of claim 1, wherein said amount of said pad within said first region is proportional to the number of pixels of said image within said first region.

3. The method of claim 1, wherein said first region corresponds to the specified hole position.

4. The method of claim 1, wherein said first region is larger than and includes the specified hole position.

5. The method of claim 1, wherein said processing includes filtering said image to differentiate said pad from said hole and from said PCB surface.

6. The method of claim 1, wherein said error threshold is a predetermined proportion of the area of said first region.

7. The method of claim 1, wherein said error threshold is determined from an indication of the diameter of said hole, and an indication of the diameter of said pad, and an indication of the minimum width of the pad material between said hole and said pad edge.

8. The method of claim 7, wherein said pad edge is approximately circular and is centered about said specified hole position, and wherein said error threshold corresponds to the amount of pad within the area of the specified hole position resulting in a minimum width of said pad between said hole and pad edge.

9. A method of processing an image of a printed circuit board (PCB) in an Automated Optical Inspection system to determine the acceptability of a hole with a specified hole position on said PCB, where said specified hole position is over a conductive pad on the surface of said PCB defining a pad edge, comprising:

processing said image to determine the location of said pad within a first region that includes said specified hole position;

determining an amount of said pad within said first region;

determining an error threshold of said material within said first region; and

providing an indication that said hole is unacceptable if said amount of said pad material within said region exceeds said error threshold.

10. The method of claim 9, wherein said amount of said pad within said first region is proportional to the number of pixels of said image within said first region.

11. The method of claim 9, wherein said first region corresponds to the specified hole position.

12. The method of claim 9, wherein said first region is larger than and includes the specified hole position.

13. The method of claim 9, wherein said processing includes filtering said image to differentiate said pad from said hole and from said PCB surface.

14. The method of claim 9, wherein said error threshold is a predetermined proportion of the area of said first region.

15. The method of claim 9, wherein said error threshold is determined from an indication of the diameter of said hole, and an indication of the diameter of said pad, and an indication of the minimum width of the pad material between said hole and said pad edge.

16. The method of claim 15, wherein said pad edge is approximately circular and is centered about said specified hole position, and wherein said error threshold corresponds to the amount of pad within the area of the specified hole position resulting in a minimum width of said pad between said hole and pad edge.

17. A method of calculating an error threshold for determining the acceptability of a hole on a printed circuit board (PCB), where said hole has a specified hole position on said PCB, and where said specified hole position is over a conductive pad on the surface of said PCB defining a pad edge, comprising:

determining an amount of said pad within a first region of a PCB corresponding to a specified width of material between said hole and said pad edge, where said specified hole position is obtained from computer aided design/computer aided manufacturing (CAD/CAM) data and a tool table, and where said pad edge is obtained from a raster image of said CAD/CAM data.

18. The method of claim 17, further comprising:

adjusting said determined amount to increase or decrease the sensitivity of said error threshold.

19. A carrier medium carrying one or more computer readable code segments to instruct a processor of a processing system to implement a method of processing an image of a printed circuit board (PCB) to inspect a hole with a specified hole position on said PCB, where said specific hole position is over a conductive pad on the surface of said PCB defining a pad edge, the method comprising:

processing said image to determine the amount of said pad within a first region of said image;

comparing the amount of pad material within a first region with an error threshold; and

providing an indication of the acceptability of said hole from the results of said comparing.

20. The carrier medium of claim 19, wherein said amount of said pad within said first region is proportional to the number of pixels of said image within said first region.

21. The carrier medium of claim 19, wherein said first region corresponds to the specified hole position.

22. The carrier medium of claim 19, wherein said first region is larger than and includes the specified hole position.

23. The carrier medium of claim 19, wherein said processing includes filtering said image to differentiate said pad from said hole and from said PCB surface.

24. The carrier medium of claim 19, wherein said error threshold is a predetermined proportion of the area of said first region.

25. The carrier medium of claim 19, wherein said error threshold is determined from an indication of the diameter of said hole, and an indication of the diameter of said pad, and an indication of the minimum width of the pad material between said hole and said pad edge.

26. The carrier medium of claim 25, wherein said pad edge is approximately circular and is centered about said specified hole position, and wherein said error threshold corresponds to the amount of pad within the area of the specified hole position resulting in a minimum width of said pad between said hole and pad edge.

27. A carrier medium carrying one or more computer readable code segments to instruct a processor of a processing system to implement a method of processing an image of a printed circuit board (PCB) in an Automated Optical Inspection system to determine the acceptability of a hole with a specified hole position on said PCB, where said specified

hole position is over a conductive pad on the surface of said PCB defining a pad edge, the method comprising:

processing said image to determine the location of said pad within a first region that includes said specified hole position;

determining an amount of said pad within said first region;

determining an error threshold of said material within said first region; and

providing an indication that said hole is unacceptable if said amount of said pad material within said region exceeds said error threshold.

28. The carrier medium of claim 27, wherein said amount of said pad within said first region is proportional to the number of pixels of said image within said first region.

29. The carrier medium of claim 27, wherein said first region corresponds to the specified hole position.

30. The carrier medium of claim 27, wherein said first region is larger than and includes the specified hole position.

31. The carrier medium of claim 27, wherein said processing includes filtering said image to differentiate said pad from said hole and from said PCB surface.

32. The carrier medium of claim 27, wherein said error threshold is a predetermined proportion of the area of said first region.

33. The carrier medium of claim 27, wherein said error threshold is determined from an indication of the diameter of said hole, and an indication of the diameter of said pad, and an indication of the minimum width of the pad material between said hole and said pad edge.

34. The carrier medium of claim 33, wherein said pad edge is approximately circular and is centered about said specified hole position, and wherein said error threshold corresponds to the amount of pad within the area of the specified hole position resulting in a minimum width of said pad between said hole and pad edge.

35. A carrier medium carrying one or more computer readable code segments to instruct a processor of a processing system to implement a method of calculating an error threshold for determining the acceptability of a hole on a printed circuit board (PCB), where said hole has a specified hole position on said PCB, and where said specified hole position is over a conductive pad on the surface of said PCB defining a pad edge, said method comprising:

determining an amount of said pad within a first region of a PCB corresponding to a specified width of material between said hole and said pad edge, where said specified hole position is obtained from computer aided design/computer aided manufacturing (CAD/CAM) data and a tool table, and where said pad edge is obtained from a raster image of said CAD/CAM data.

36. The method of claim 35, further comprising:

adjusting said determined amount to increase or decrease the sensitivity of said error threshold.

37. An apparatus for inspecting holes of a printed circuit board (PCB) to compare the position of a hole with a specified hole position on said PCB, where said specific hole position is over a conductive pad on the surface of said PCB defining a pad edge, comprising:

a camera to image a hole having a region of interest about said hole; and

a computer to accept instructions to process said image to determine the amount of said pad within said region of interest and having means to provide an indication of the acceptability of said hole from the amount of said pad material within said region of interest.